

## **NANOSTRUCTURED PROTON EXCHANGE MEMBRANE FUEL CELLS**

### **ABSTRACT OF THE DISCLOSURE**

A novel proton exchange membrane fuel cell with nanostructured components with higher precious metal utilization rate at the electrodes, higher power density, and lower cost. Aligned arrays of carbon nanotubes, either single wall or multiwall, are prepared by catalyzed chemical vapor deposition (CVD), or plasma assisted CVD and used as support for catalyst. Solubilized perfluorosulfonate ionomer membrane is incorporated into the spare space between nanotubes to form a 4-phase boundary of gas, metal, proton conductor, and electron conductor. By assembling the as-prepared electrodes with perfluorosulfonate ionomer membrane, backing layers and electron collectors, proton exchange membrane fuel cells are developed.